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Structure of Motor Space in Children at 7 Year Age

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Structure of Motor Space in Children at 7 Year Age: *At the exemplar of 100 inquired from man sex at 7 years age, has been used 33 motor tests for estimating the 10 motor dimensions. With using factor analyze has bees isolated 11 latent motor dimensions. Figured factor structure gives opportunity for implementation of the differenced education for physical culture with children at early school age.*

Key words: *pupils, male, 7 years, motor tests, factor analyse*

INTRODUCTION

Successful realization of concrete sport activities, beside the rest is in dependence of methodical and systematic planning and successful implementing of the educational process. Realization of the planed goals for the predicted activities in big percent is in dependence of the influence of more factors. Motor abilities as one of the factors in some body activities in biggest percent determinate successful performance, or realization of the established goals in educational process.

Investigation has been realized with goal to be figured the structure of the motor abilities to the pupils from male sex at 7-year age.

METHOD OF WORK

With goal to be figured out the structure of the motor abilities, at exemplar of 100 pupils from second grade at 7 year age has been measured 33 motor tests which hypothetically are designed for evaluation of 10 latent motor dimension. Choice and performance at motor tests is has been done according to recommendations of D. Metikoš and collaborators [3], D. Perić [4], S. Dukovski [2]. Those are tests (with name and code): 1) coordination - coordination with baton (KOPAL), Polygon forward (KOPON), slalom with 2 balls (KOSL2) and rolling with ball (KOTRT); 2) speed of running – 10 m flying start (BT10LS), 4x10m (BT4x10), running like a snake 4x5m (BTZMT); 3)segmental speed-tapping with hand (BSTAR), taping with leg (BSTAN) and taping with legs at wall (BSTN3); 4) explosive strength - jump in distance from start place (ESSDM), throwing away medicinal 1kg. in distance (ESFMST), throwing the medicinal with sitting in the high of breasts (ESFMG) and 20m high start (EC20BC); 5) repetitive strength –(RSSKL), elevating the body (RSPTR), putting the body in right position (PSITR), reptile with the hands diagonal bench (PSBKK); 6) static strength (SSBZG), how long can you stay in condition lying on stomach (SSZLM), keeping in a condition lying at back (FLRLG), 8) balance – walking at turned Swedish bench (RAOSK), staying at bench in wideness (RASKS) and staying at bench in length (RASKD); 9) precisely with throwing (PIOBS), throwing balls to goal (PITET), centering in horizontal goal with balls (PITHC), centering in vertical goal with ball (PIVCN), precisely with leading - centering with short stick (PVGKS) and centering with long stick (PVGDS).

At the results from motor tests has been calculated the basic descriptive statistic parameters. For figuring the connection of the results between motor tests has calculate **Pearson's** coefficients of correlation (r). The correlation matrix at motor tests are in the authors.Latent structure of the used motor tests is figured with the use of the Hotelling's factor analyze, and for interpretation is used slash rotation (structure matrix). Factors were isolated according to Kaiser – Guttmann criteria, according to which for important are treated those that are with equal or bigger value than 1.00.

RESULTS AND DISCUSSION

Starting inter-correlation matrix of the implemented motor tests is factorized with Hotelling's method (table 1).

Table 1

Factor analyze of motor tests in children at 7-year age Hoteling's procedure

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	h^2
KOPAL	-0,32	-0,30	0,45	0,37	0,09	-0,12	-0,07	0,11	-0,03	-0,27	0,12	0,66
KOPON	-0,41	0,01	0,42	0,06	-0,03	-0,03	0,05	0,35	0,19	0,16	0,38	0,69
KOSL2	-0,60	0,30	0,07	0,22	0,07	0,10	-0,28	-0,03	0,08	0,19	-0,02	0,65
KOTRT	-0,41	-0,42	0,09	-0,11	0,23	-0,14	0,01	0,24	-0,33	-0,06	-0,15	0,63
BT10LS	-0,12	0,51	-0,04	-0,31	0,18	0,17	-0,03	-0,29	-0,27	-0,12	0,21	0,66
BT4X10	-0,38	0,60	0,06	-0,13	0,08	-0,04	0,09	-0,18	-0,11	0,34	-0,24	0,76
BTZMT	-0,27	0,56	0,36	0,11	0,19	-0,07	-0,42	-0,10	0,12	-0,10	-0,18	0,82
BSTAR	0,31	0,34	-0,38	0,32	-0,19	0,29	0,00	0,12	-0,13	0,09	-0,11	0,63
BSTAN	0,44	0,19	-0,31	0,02	-0,13	-0,06	-0,10	0,20	-0,28	0,23	0,15	0,55
BSTNZ	0,55	0,18	-0,05	-0,16	-0,25	-0,08	0,31	0,16	-0,02	0,12	0,20	0,60
ESSDM	0,70	-0,25	0,02	0,09	-0,04	0,27	-0,11	-0,03	0,22	-0,05	0,04	0,70
ESFMST	0,59	0,07	0,08	0,52	-0,09	-0,04	0,15	0,09	0,09	-0,07	-0,03	0,68
ESFMG	0,46	0,39	0,03	0,22	-0,32	-0,12	0,26	0,14	0,07	-0,23	-0,04	0,68
ES20VS	-0,62	0,09	0,03	-0,09	-0,11	0,22	0,31	0,26	0,10	0,25	-0,07	0,70
RSSKL	0,52	-0,04	0,37	-0,27	0,05	-0,01	0,20	0,11	0,09	-0,04	-0,22	0,59
RSPTR	0,51	0,06	0,41	-0,09	0,04	0,10	-0,10	0,04	0,04	-0,05	0,32	0,57
RSITR	0,52	0,09	0,24	-0,18	-0,02	-0,06	0,09	0,15	0,08	0,05	-0,47	0,63
RSVKK	-0,43	0,50	0,14	0,17	-0,21	-0,14	0,28	-0,09	-0,03	-0,09	0,11	0,66
SSBZG	0,46	-0,15	-0,07	-0,26	0,00	0,14	-0,46	0,16	0,17	0,25	-0,14	0,67
SSZLM	0,50	0,32	0,46	-0,28	-0,13	0,13	-0,13	0,00	-0,02	-0,13	-0,06	0,71
SSZLG	0,31	0,38	-0,13	0,27	0,19	0,29	0,08	0,02	-0,23	0,02	-0,07	0,52
FLPRK	-0,08	0,00	-0,35	0,28	0,56	0,14	0,00	0,34	0,14	0,01	-0,05	0,68
FLRLG	0,13	-0,33	0,03	0,20	0,18	0,52	0,24	-0,41	-0,07	-0,05	0,05	0,70
FLPRS	0,22	0,19	0,21	0,41	0,24	0,21	0,06	-0,16	0,39	0,12	0,02	0,59
RAOШК	-0,45	0,09	0,08	-0,21	0,15	0,07	0,33	0,07	0,27	0,23	0,21	0,57
RASKШ	0,47	0,14	0,51	0,04	0,18	-0,11	-0,07	-0,12	-0,33	0,14	0,16	0,71
RASKD	0,38	-0,23	0,27	0,25	0,09	0,03	-0,07	0,14	-0,45	0,47	0,13	0,80
PIOBS	0,36	-0,30	-0,09	-0,14	0,18	-0,16	0,38	-0,43	0,05	0,17	0,00	0,67
PITET	0,02	-0,02	0,18	0,15	0,44	-0,23	0,29	0,07	-0,25	-0,11	-0,24	0,53
PITHC	0,34	-0,04	0,02	0,16	0,11	-0,51	-0,04	-0,24	0,30	0,39	-0,05	0,71
PIVCN	0,24	0,14	-0,43	0,18	0,05	-0,56	-0,18	-0,11	0,02	-0,08	0,20	0,70
PVGKS	0,35	0,34	-0,16	-0,17	0,48	-0,13	0,15	0,31	0,08	-0,14	0,06	0,69
PVGDS	0,38	0,20	-0,21	-0,35	0,44	0,07	-0,07	0,04	0,12	-0,11	0,26	0,66
Lambda	5,80	2,73	2,20	1,80	1,62	1,48	1,42	1,28	1,26	1,11	1,07	
%	17,56	8,27	6,67	5,46	4,92	4,49	4,31	3,87	3,81	3,36	3,25	
Cum%	17,56	25,84	32,50	37,96	42,88	47,37	51,68	55,55	59,36	62,72	65,97	

Variability of the system of the used motor tests cumulatively is explained 65, 97%. First main component has biggest contribution in explanation of the variability of the system 17, 56%. Highest values of the communality from .70 to .82 have 10 motor tests.

Implemented Varimax method doesn't give clear view at the isolated components. Because of that the same are transformed in orthogonal and slash protections. In further interpretation of the results we will use factor analyze in Oblimin's procedure – matrix of the structure (table 2).

First isolated main component with 17,56% participate in explanation of total variability of the used system of motor variables. Significant projections have four variables designed for approximation of the four motor abilities: flexibility, static strength, precisely ability for throwing out and precisely ability for leading.

Table 2

Factor analyze of the motor tests to the children at 7 year age - Oblimin's procedure

	O1	O2	O3	O4	O5	O6	O7	O8	O9	O10	O11
KOPAL	-0,11	0,22	0,69	-0,13	-0,32	0,11	0,12	-0,09	-0,23	0,09	0,11
KOPON	0,04	0,20	0,41	-0,03	-0,14	0,14	0,66	0,18	-0,11	0,07	0,16
KOSL2	-0,07	0,67	-0,06	-0,07	-0,22	0,16	0,38	0,06	-0,14	-0,16	0,42
KOTRT	-0,24	0,03	0,30	-0,69	-0,25	0,10	0,15	-0,07	-0,09	-0,04	0,07
BT10LS	0,25	0,30	-0,33	-0,09	0,53	0,21	0,04	-0,08	-0,26	-0,02	0,14
BT4x10	0,10	0,55	-0,51	-0,14	0,04	-0,02	0,35	0,09	-0,38	-0,08	0,03
BTZMT	0,06	0,86	0,05	0,10	0,10	0,09	0,08	0,18	-0,20	-0,04	-0,02
BSTAR	-0,19	-0,14	-0,54	0,46	0,00	0,26	-0,31	0,13	0,04	0,16	0,04
BSTAN	-0,03	-0,31	-0,39	0,20	0,20	0,02	-0,31	0,35	0,16	0,39	0,02
BSTNZ	0,20	-0,52	-0,24	0,35	0,28	-0,08	-0,10	0,25	0,02	0,28	-0,32
ESSDM	0,00	-0,38	0,11	0,49	0,14	-0,08	-0,41	-0,21	0,51	0,26	-0,31
ESFMST	-0,18	-0,26	0,05	0,65	-0,04	-0,11	-0,40	0,07	-0,05	0,38	-0,30
ESFMG	0,08	-0,24	-0,14	0,59	0,10	0,06	-0,29	0,34	-0,25	0,13	-0,35
ES20VS	-0,07	0,17	-0,14	-0,23	-0,30	0,28	0,72	0,00	-0,20	-0,30	0,16
RSSKL	0,11	-0,22	0,10	0,14	0,21	-0,12	-0,11	-0,05	0,13	0,24	-0,74
RSPTR	0,25	-0,11	0,24	0,35	0,38	0,01	-0,12	-0,02	0,20	0,46	-0,35
RSITR	0,02	-0,12	-0,11	0,18	0,09	-0,13	-0,22	0,10	0,15	0,20	-0,75
RSVKK	0,19	0,32	-0,10	0,10	-0,10	0,15	0,32	0,19	-0,66	-0,17	0,19
ССВ3Г	0,02	-0,12	-0,10	0,10	0,14	-0,09	-0,22	0,10	0,75	0,18	-0,26
SSZLM	0,42	0,07	-0,01	0,31	0,36	0,16	-0,19	0,09	0,13	0,31	-0,59
SSZLG	-0,27	0,03	-0,38	0,36	0,22	0,19	-0,25	-0,09	-0,14	0,32	-0,10
FLPRK	-0,78	0,06	-0,03	0,03	0,12	0,03	0,05	-0,05	0,05	-0,06	0,16
FLRLG	-0,07	-0,16	0,05	0,13	-0,04	0,04	-0,09	-0,79	0,04	0,11	0,03
FLPRS	-0,20	0,21	0,06	0,58	0,07	-0,18	0,05	-0,25	0,00	0,17	-0,13
RAOШК	-0,01	0,13	0,01	-0,14	0,07	-0,03	0,72	-0,08	-0,17	-0,25	0,14
RASKШ	0,21	0,07	0,11	0,17	0,29	-0,15	-0,22	-0,05	-0,07	0,73	-0,36
RASKD	-0,09	-0,18	0,05	0,05	-0,12	-0,08	-0,13	-0,08	0,17	0,84	-0,14
PIOBS	0,05	-0,41	-0,07	-0,01	0,15	-0,59	-0,15	-0,39	0,03	0,07	-0,21
PITET	-0,37	0,07	0,13	-0,19	0,04	-0,15	-0,08	-0,12	-0,42	0,19	-0,28
PITHC	-0,02	-0,03	0,01	0,23	0,00	-0,78	-0,15	0,13	0,11	0,19	-0,13
PIVCN	-0,11	-0,14	-0,08	0,15	0,23	-0,43	-0,45	0,41	-0,07	0,00	0,27
PVGKS	-0,37	-0,11	-0,14	0,14	0,64	-0,10	-0,10	0,24	-0,08	0,09	-0,30
PVGDS	-0,12	-0,13	-0,12	0,11	0,76	-0,10	-0,13	0,01	0,22	0,06	-0,13

Significant influence of the four different motor variables of first main component shows at existing of complex motor dimension. Based on important projections of mentioned tests, their connection in correlation matrix is biggest contribution of the test

front – inclination at desk first isolated factor conditionally can be define as **active movements in pelvis joint (flexibility).**

Second factor is isolated and with significant projections on it with nine motor tests, that are designed for estimation of six hypothetic dimensions. Biggest partial contribution has tests for estimation of the speed of running. In motor tests with important projections dominate tasks that are performed with fast movements with legs and arms. This factor is named as factor for **speed of running.**

At third factor significant projections have the variables for estimation of the coordination. In tests with significant projections, dominant moving activity is speed of movements of legs and arms. During the performance of fast movements with legs, arms and whole body, all movements have to be coordinate. For performing the fast moving, its necessary power of the muscles that take part in performance of the moving. If it's considered that coordination and speed are dominant while the performance in mentioned tests, third factor can be define as **coordinate speed with legs and arms.**

Fourth factor is saturated with motor tests for evaluation of the explosive strength. Based on the number and high of important projections of the tests for explosive strength, fourth factor we named as **factor for explosive strength.**

At fifth factor, important projections have seven motor variables for estimation of six hypothetic motor abilities. Highest are projections at the variables for evaluation of the precisely in leading. Based on high projections at the tests for precisely and dependence at the movements at the tests for precisely of the strength of the body and coordination at the legs and arms, fifth isolated factor can define as **precisely in leading.**

Sixth factor is most clearly isolated with significant projections at the tests for precisely with throwing out. The other tests doesn't have important projections. **Sixth factor is named as precisely with throwing out.**

Seventh factor meaningfully is connected with ten motor tests which evaluate six segments from motor space. That shows at presence at complex factor. With bigger dose at carefulness, structure of seventh factor, can be based at three basic motor dimensions: coordination, speed and strength. **Seventh factor is define as coordinated speed strength** (manifesting the strength during the performance of speed and coordinated movements with legs and arms).

At eight factor significant projections has four motor tests designed for evaluation of the three motor abilities. The same tests has important and higher projections and at the other isolated factors, **that doesn't allow us defining this factor.**

Ninth factor is saturated with significant projection from the tests for evaluation of the repetitive strength and static force at the muscles of the hands and shoulder parts. Based at significant projections at the tests for evaluation at the strength of the arms and shoulder parts and necessity for strength while throwing out the ball in vertical goal, **ninth factor can be define as strength at the muscles of the hands and shoulder parts.**

Tenth isolated factor mostly is saturated with tests for evaluation at the balance. For maintaining the balance position at the body while standing at one leg, strength of the muscles of the body and ability for fast activation and relaxation of the muscles of the legs, has important influence during achieving at better results at the tests for balance. Tenth factor is named as **factor for balance.**

Eleventh factor, important and high projections has the tests for evaluation of the repetitive strength at the muscles of the arms, shoulders and body. Significant projections at eight factor from the tests for evaluation at the strength of the body and hands, provides **eleventh factor to be define as factor for repetitive strength at body and arms.**

Evaluation at the motor status to the children at 7 year age, present **specific problem.** Problems are related at the choice and validity at the measure instruments, performance and motivation at the exemplars, explanation and understanding the established goals. Intensive changes and individual tempo of the growth and development at the children makes the biggest variability in received results.

If it's considered that for figuring the latent structure of motor space to the children at 7 year age , are implemented motor variables used in until now investigations, it was expected to be isolated identical or similar factor structure, just like in the exemplars from other age groups.

Received structure at motor space in the children at 7 year age differs from the expected one. It has been received new, according to our opinion, original factors that are define cording to the structure at the motor tasks and their topological determinacy. Similar define factors to the children at 5 year age are received in investigation of Perić [4]. Analyzed structure shows existence at 11 total latent motor dimensions. Part from the dimensions are clearly isolated, exists separately to the children at 7 year age and are confirmed in investigations until now (balance, precisely, fast running, segmental speed).

Abilities that depend from the intensity and circumference at the energetic exits-explosive and repetitive strength, aren't clearly isolated. In this motor abilities exists tendency for integration and common manifestation while performance at the motor tasks. Their manifestation is more expressed according the topological determination of the movements, probably because not enough sinhronization at the movements with legs, arms and body. The same are define as: **explosive strength;explosive strength at the arms and shoulder parts, strength at the body, arms and shoulder parts;strength at the arms and shoulder parts.**

Similar results and similar define factors are received in investigations at Šturm & Strel [7]; Rajtmajer [6]; Perić [4]; Bala [1]; Pišot & Planinec [5].

Beside mentioned , received are and some new combined specific motor dimensions as result at common participation at motor dimensions as result at common participation at motor abilities(coordination, speed, strength) while the performance at motor tasks that are performed with legs, arms and body, while it they are performed fast and it's overcoming particular weight. So isolated dimensions are define as: **coordinated fast and explosive movement with legs , arms and body; coordinate speed strength, coordinate speed with arms and legs, fast and explosive movement with legs e.t.c.**

CONCLUSION

Existence at different number factors with different structure in latent motor space to the children at 7 year age, shows at specific changes in motor space that are result of the specifics in development of every individual, influence at the genetic factor, interpersonal relations of the particular segments from anthropology status of the pupils, structure of the moving tasks implemented in investigations, numerous internal and external influences during the realizations of the tests e.t.c.

Depending from body movements in motor tests, potential motor abilities are manifested as special or specific motor abilities in which are integrate more motor abilities connected with one dominant ability from which mostly depends the performance of the moving from the structure of motor tests.

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